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Ponderosa Pine Tip Moth

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The ponderosa pine tip moth, *Rhyacionia zozana* (Kearfott), is a pest of young trees in the foothill pine forests of the Sierra Nevada and Cascade ranges in California, Oregon, and Washington (fig. 1). In California, where it has been most commonly reported, this tip moth is generally found between 2,000 and 4,500 feet elevation. It usually attacks trees less than 6 feet tall.

The larvae feed in the new shoots, causing varying amounts of tree deformation. There is one brood a year. Applied control is generally unnecessary, but young larvae are readily killed by a DDT spray.

Tip moth damage is usually neither spectacular nor serious; however, under certain conditions it can be important. This was demonstrated in 1962 and 1963 at a U.S. Forest Service seed orchard near

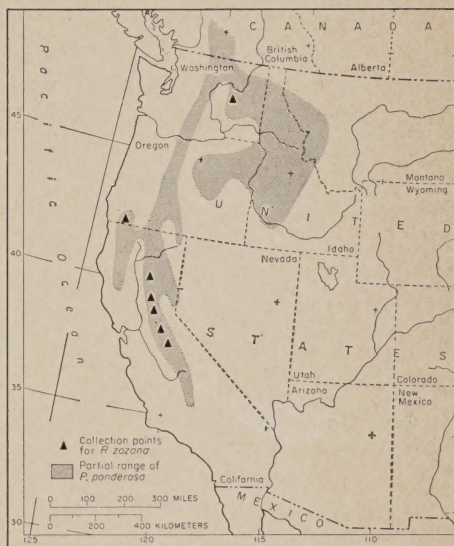


Figure 1.—Collection points for ponderosa pine tip moth (triangles) and partial range of ponderosa pine, its most important host.

Placerville, El Dorado County, Calif. There moths from the surrounding pine forests invaded plantations used in tree improvement work. The progeny of these moths then destroyed newly grafted Jeffrey and sugar pine leaders, resulting in the loss of many man-hours of highly skilled work.

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Hosts

Ponderosa pine is the only tree species the tip moth commonly attacks in nature, although it occasionally attacks sugar pine and Digger pine. At the Institute of Forest Genetics, Placerville, Calif., *Rhyacionia zozana* was found infesting 17 other pine species and

hybrids, including Jeffrey pine, lodgepole pine, and western white pine. These species vary so in characteristics that most pines are considered likely to be suitable hosts when planted within the tip moth's natural range.

Evidences of Infestation

Fading of all or parts of new shoots in early summer is the first commonly seen indicator of tip moth activity. The needles growing from the affected portion of the shoots cease to elongate, and rapidly turn from the normal green color to a pale yellow. The dead tips remain rigid, the foliage slowly darkening until by winter it is a dull reddish brown. The tips are totally or mostly mined out and are held in place chiefly by the outer bark, which is not eaten.

A closer examination of an attacked tip shows silken "tents" spun by the larvae around the bud and bases of the needle bundles. These tents are the first readily visible sign of tip moth larval activity in the spring; however, even they are relatively inconspicuous and are often overlooked. As larval development progresses and the infested tips begin to fade, the tents become coated with pitch, and frass accumulates around the area of activity.

A cluster of tough silken cocoons at the base of a tree is another sign of tip moth infestation. Oftentimes a cluster will completely encircle the

tree, making a "collar" at the ground line. Drooping leaders are not an indication of attack from the ponderosa pine tip moth, but result from the activities of other kinds of insects or abnormal physiological conditions of the tree.



Figure 2.—Ponderosa pine shoot killed by tip moth attack. New buds have developed below killed portion of tip.

Damage

Damage to infested trees is caused by the larvae mining in the new shoots. This results in the death of the bud and the mined-out portion of the shoot (fig. 2) and in the subsequent development of a new leader or (less commonly in ponderosa pine) multiple leaders. Ponderosa pine generally overcomes this injury unless it is attacked repeatedly, and by the time trees are 8 to 10 feet tall little evidence of damage

remains. Heavy attacks year after year will seriously retard growth, however, and predispose trees to attack by insects that seem to prefer hosts in relatively weakened conditions. The pine reproduction weevil, *Cylindrocopturus eatoni* Buchanan, is an example of such an insect. Tree mortality due solely to tip moth feeding has never been observed.

Description of Stages

The tip moth adult (fig. 3A) has a wing expanse of about 20 mm. The forewings are irregularly banded with gray and white on the inner two-thirds, and are mostly brick red on the outer one-third. The hindwings are a grayish brown. When the insect is at rest it holds its wings rooflike over its body.

The eggs (fig. 3B) are nearly round, flattened, and about 1 mm. in diameter. When first laid they are a pale greenish yellow. As the embryo develops, the egg turns orange, and before hatching the tiny larva can be distinguished inside.

Larvae (fig. 3C) are generally orange in color; there are four instars. During the last two instars a rosy color overlays the orange on the upper part of the thorax and last three or four abdominal segments. The head capsule and anal plate are dark brown to black in the younger larvae and tan in the final two instars. Fully developed larvae are about 12 to 15 mm. long.

The pupae (fig. 3D) typically occur in tough, silken cocoons. They are generally brown in color and measure 6 to 7 mm. long.

Life History and Habits

In California adult emergence begins in March or April (fig. 4), and oviposition begins soon thereafter. The eggs are laid about the time ponderosa pine shoot elongation is slowing down and the new needles are emerging from the fascicle sheaths and beginning to elongate. Most of the eggs are laid

on the new shoots themselves (fig. 2B), although some are found on the older needles and on the older shoots.

The eggs hatch within 2 weeks, and the tiny larvae move to a junction of a fascicle of needles and a shoot and join them together with a tent. The larvae feed within the

protection of this tent, boring at first into the succulent growing point of the needle bundle and also into the green bark of the new shoot

itself, feeding on the wood and the pith. The larvae commonly feed gregariously; several often feed in a single tip, and up to 30 have been

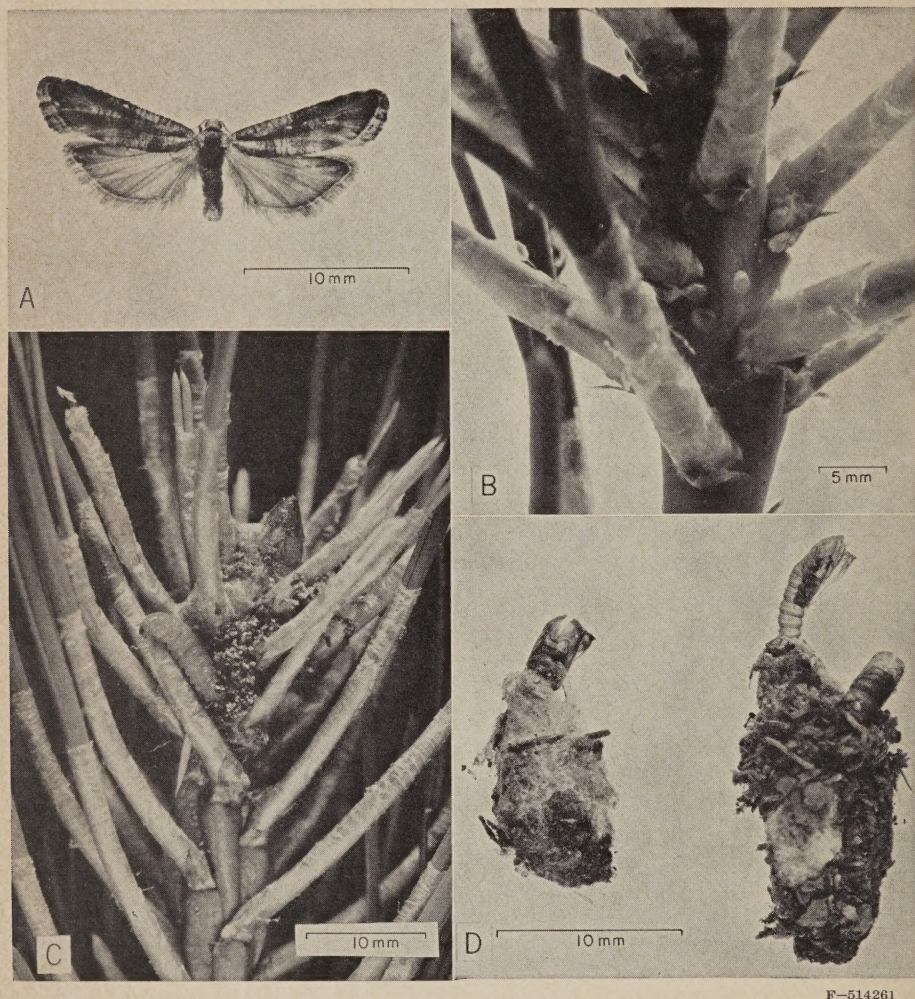


Figure 3.—Ponderosa pine tip moth: A, Adult moth; B, eggs typically located on new shoots; C, fully developed larva on infested shoot; D, pupal cases protruding from cocoons.

itself. They coat the inner surface of the tents with resin exuding from the wounds in the tree, and the tents take on a shiny, soapbubblelike appearance.

As development progresses the larvae begin mining into the shoot

found. Generally they mine from the tip back toward the base of the shoot. Mining does not proceed in an orderly fashion. Individual galleries usually are not identifiable. Most of the wood within the infested portion of a tip is destroyed,

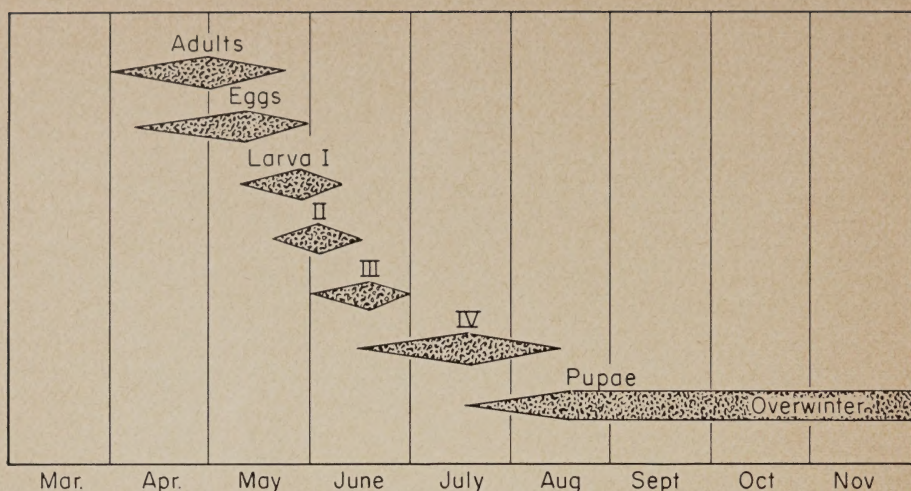


Figure 4.—Life cycle of the ponderosa pine tip moth in California.

but occasionally pieces of tissue will be left in place. Almost all frass is pushed outside (fig. 3C).

Mining ceases in the early summer. Most of the larvae then crawl out of the tips and down to the ground where they spin their co-

cons, firmly attached to the bark. A few spin their cocoons inside the mined tip or on the bark of the stem somewhere between the tip and the ground. By autumn all have pupated; all pass the winter in the pupal stage.

Control

In most forest situations natural factors operate to keep ponderosa pine tip moth populations under control. Important among these are parasitic insects, including a *Trichogramma* egg parasite and several larger ichneumonoid wasps. Most of these larger wasps probably attack the tip moth larvae; they develop at the expense of the host larva or pupa.

Because trees generally overcome tip moth damage, applied control is unnecessary under forest conditions. When protection is desired for seed orchards or other high-value plantings, however, control using insecticides is effective. A DDT spray

formulated to provide 2 pounds of the insecticide per 100 gallons of water and applied to the point of runoff with a hand sprayer adequately prevents damage, and is harmless to the trees. The spray is applied soon after the eggs hatch, before the larvae begin the destructive shoot-mining part of their life history. If more extensive applications are necessary the use of a mist-blower may also be effective.

Clipping of infested shoots before the larvae leave to pupate will reduce populations but does nothing to alleviate the current year's damage. Nevertheless, it might be a useful practice in some ornamental

plantings. The clipped tips should be destroyed to prevent older larvae from completing their development.

Caution: DDT and other insecticides are poisons. Store them away from food products, and read and follow closely the directions and precautions on the container label.

References

THE PONDEROSA PINE TIP MOTH, *Rhyacionia zozana*, in California (Lepidoptera: Olethreutidae). ROBERT E. STEVENS. Ann. Ent. Soc. Amer. 59(1):186-192. 1966.

DDT SPRAY FOR CONTROL OF THE PON-

If insecticides are handled or applied improperly, they may be injurious to humans, domestic animals, desirable plants, honeybees and other pollinating insects, fish, and wildlife. Also they may contaminate water supplies.

DEROSA PINE TIP MOTH, *Rhyacionia zozana* (Kearfott). ROBERT E. STEVENS. U.S. Forest Serv. Pacific SW. Forest and Range Expt. Sta. Res. Note PSW-57, 3 pp., illus. 1965.



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